DOCUMENT RESUME

ED 207 240 EA 014 048

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TITLE Production of Academic Achievement as a Function of Teachers' Training, Experience and Salaries.
INSTITUTION National Inst. of Education (DHEW), Washington, D.C.
SPONS AGENCY National Inst. of Education (ED), Washington, D.C.
PUB DATE Apr 81
NOTE 22p.; Paper presented at the Annual Meeting of the American Educational Research Association (Los Angeles, CA, April 13-17, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Administrative Policy; Elementary Education; Expenditures; *Outcomes of Education; Peer Influence; Predictor Variables; Racial Factors; Teacher Influence; *Teacher Qualifications; Teaching Experience
IDENTIFIERS Missouri (Saint Louis)

ABSTRACT

In an attempt to link public school expenditures to educational outputs, achievement test results of 6,605 elementary students in St. Louis, Missouri, were analyzed to see whether training and experience of teachers has an impact on student outcomes. The researchers matched individual students with teachers for five-year periods during grades three through eight. Variables examined include students' testscores and race, school enrollment and attendance, pupil-teacher ratios, percentage of non-white students and teachers, ratings of teachers' baccalaureate and graduate institutions, and eight factors relating to achievement levels of students' classmates. The study found that previous achievment levels and student intelligence are excellent predictors of achievement; that teacher experience is occasionally a factor in student achievement; and that the effect of teacher and school variables is larger for black students than for white students. The study concludes that school level variables explain virtually none of the variation in student achievement and that it is unlikely that such factors as administrator intensity, teacher and pupil attendance rates, and resource allocation will have much impact on student achievement. (JEH)

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PRODUCTION OF ACADEMIC ACHIEVEMENT AS A FUNCTION OF TEACHERS' TRAINING, EXPERIENCE AND SALARIES

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This work has been partially funded by the National Institute of Education.

AERA April 1981

EA 014 048

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Introduction

During recent years there has been much interest in two problems facing elementary and secondary schools. The first of these is the improvement of basic skills in students, while the second is the proper allocation of scarce financial resources. Neither of these problems is new. What is new is that declining student enrollments and declining abilities of school districts to raise enough local tax dollars to maintain programs, have made the connection of resource allocation to student outcomes an issue of some concern to school administrators.

There is little research literature which links the financial inputs of the schooling process to student outcomes. That this should be so is not surprising. For years the study of schooling has been an enterprise directed largely by psychologists. Recently sociologists have joined their skills to the research quest, and more recently still have come economists. The research in this area is quite embryonic, although it is clear that certain aspects of the research have been conducted quite thoroughly.

The closest approximations to studies which link financial inputs to the schooling process with student outcomes are studies which link actual inputs (regardless of their costs) to student outcomes. Cohn and Millman (1975), and Mandel (1975) provide excellent discussions of the educational process viewed in an input/output context. They point out that there are both school and non-school inputs, as well as many outputs. Of ten considered, inputs include pupil/teacher ratio, teacher quality, race, IQ, and family background, among many others. Only a few studies consider outputs other than student achievement, such as the attainment of vocational skills, attitude adjustment, and high school dropout rates.

Boardman, et. al., (1977) conducted a simultaneous equation analysis examining six outputs, but this type of analysis is rare.

Our concern is with the results of those studies which focus on the school inputs to the educational process as they affect student achievement.*

Results of input/output studies of the educational process are not conclusive. For example, with regard to teacher experience, the Coleman report (1966) found no significant impact on student achievement, while Katzman's (1968) study found an inconclusive relationship. Goodman (1959), Thomas (1962), and Hanushek (1968,1972) found, on the other hand, that teacher experience has a positive impact on achievement. Boardman, et. al., using a quadratic specification for experience, found that teachers with only a few years of experience, ceteris paribus, affect student achievement negatively, while more experienced teachers have a positive impact on achievement. Summers and Wolfe (1975), studying elementary schools in Philadelphia, found that high achieving students do best with experienced teachers, while underachievers do best with inexperienced teachers. In the high school portion of their analysis, the impact of experience is mixed, and depends on the particular subject being taught. Rosenshine (1971) summarized the results of nine studies examining the relationship between experience and achievement, and found that while the relationship was generally a positive one, it was not statistically significant.

The relationship between student achievement and verbal ability of the teacher is less confused. Coleman, Hanushek (1968), Bowles and Leven (1968), Michelson (1970), Guthrie (1971), Jencks (1972), and Boardman, et. al., all found that a teacher's verbal ability had a positive impact on student achievement.

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* We acknowledge the ambiguity surrounding the interpretation of achievement scores. However, for the present research, we accept achievement scores as a measure of value--added to basic skills.

Class size, or pupil/teacher ratio, is a school input which has long been felt to be an important determinant of achievement. Popular thinking is that the smaller the ratio, the higher is student achievement. This thinking, however, does not bear up well when subjected to statistical analysis. Kiesling (1967), Bowles (1969), and Boardman, et. al., found lower pupil/teacher ratios associated with higher student achievement. Summers and Wolfe (1975) basically found that there is an intermediate class size range (about 28 to 32) in which class size makes no difference. Travers (1973) reports five studies in which class size makes no difference. Further, Jencks and Coleman found no statistically significant relationship.

There is an extensive literature examining the relationship between school and school district size and costs per pupil (for example, Sher and Tompkins, 1976; Wales, 1973; Cohn, 1968; and Riew, 1966). Most of these studies suggest that there are economies of scale which accrue to larger districts. Few studies, with the noteable exception of Sher and Tompkins (1977), discuss the impact of school size on achievement.

Although there are many other important variables that potentially affect achievement, the last one we will discuss is the presence of administrators. What little data there is suggests that an increasing presence of administrators or pupil personnel workers (Bidwell and Kasarda, 1975) has a negative impact on student achievement.

This obviously incomplete review of input/output studies, suggests that there is certainly some question as to whether increased teacher experience, decreased pupil/teacher ratio and increased administrative presence, have the expected positive impacts on student achievement.

What is particularly distrubing about these results is that school districts pay for these questionably effective characteristics.

Our earlier work (Mark and Anderson, 1977) as well as work by Rodekohr (n.d.) shows a marked increase in the amount of experience, training, and administrative support for the teaching forces of public schools. In effect, changes have been made in inputs to the educational process. These have been costly changes, and there is no conclusive evidence that school districts are able to produce more achievement with these higher costs.

One reason for the lack of conclusive evidence is that many studies have been cross-sectional. They answer the question about investment in training by determining if the students of teachers with relatively large amounts of training have higher achievement scores than those students of teachers with relatively little training.

Aside from the considerable statistical problems associated with this approach (Boardman and Murnane, 1979, provide a good summary of these), it is conceptually weak in that an investment in training should lead to improved performance for the person who was trained. The best way to discover if this happens in schools is to follow a teacher over time to see if that teacher's performance improved as s/he becomes more highly qualified through training and experience. Cross sectional studies do not do this, and they ignore the large drop-out rate from teaching which introduces a self-selection process into what is supposed to be a representative study of teacher characteristics.

In addition, studies of school effects which use data aggregated at school and even school district levels, introduce the possibility that school effects are mis-estimated and that important variables may be masked. The problems associated with selection of an appropriate unit of analysis (detailed in Hannan, et. al., 1976 and Alexander and Griffin, 1976) may be handled well with longitudinal data arranged by student.

This paper contains the results of one part of a study designed to link expenditures to educational outputs. It is a report of a longitudinal study of several thousand students, with the data analysis being designed in such a way as to permit us to see whether or not the training and experience of those who taught the students have an impact on student outcomes.

Conventionally, this is done with a cross-sectional design, leaving open the possibility that investment in teacher training and experience has its "payoff" some years after the teacher taught the student. Our design reduces the possibility that such an outcome would occur undetected in the data.

Work which we will complete by the end of this summer will follow teachers over time, thereby giving a more definitive picture of the improved "productivity of teachers resulting from their training and experience.

The Data

The Board of Education of the City of St. Louis supplied 234,910 student achievement records spanning the years 1971 through 1976 and grades three through eight. The Missouri Department of Elementary and Secondary Education supplied salary, experience, and degree information on all certified Missouri teachers for the identical years. By matching the teacher name, school, and year with student data a longitudinal record was constructed for each student where each year's achievement history was matched to the instructor's characteristics.

Student records were eliminated if the student attended a middle or special school. The inclusion of special school, handicapped or delinquent students would make interpretation of results confusing, since these students do not take "normal" tests. Middle school students are taught by many instructors over the course of the school year. Since only data on the homeroom teacher was available, it was impossible to determine which teacher, or group of teachers was responsible for

the student's achievement. Ultimately, this step removed 15, 785 records, leaving 219,125.

The existence of duplicate student identification numbers reduced the sample to 215, 886 records. The sample was thus composed of 215,886 student records, of which 199,583 records were successfully merged with teacher data. There were 16,303 student records which could not be matched to teacher data.

On the whole, the teachers involved in the unmerged student records probably possessed little classroom experience. This tendency towards exclusion of students with inexperienced teachers does not appear to have biased the final samples. The number of excluded cases is only seven percent of the total cross-sectional sample, and inexperienced teachers are well represented.

The merged teacher/student data were supplemented by seven school-level variables, including each school's enrollment, number of Title I students, percentage of student attendance, percentage of non-white students, percentage of non-white teachers, and the pupil/teacher ratio. In order to test for a possible relationship between the teacher's undergraduate and/or graduate training and student achievement, two variables were added representing the ratings of the instructor's baccalaureate institution and graduate institution.

Peer group variables were also constructed. Grouping students by classroom, school, and year, eight variables were created to test for the peer group's impact on student achievement.*

* While peer group variables could be constructed for 99 percent of the total sample, a caution is necessary. If a student was absent the day the achievement tests were administered, that student would not appear in the student file for the given year. If these absences were non-random, variables such as class mean achievement could be mis-estimates of the true classroom mean. A rough check on the number of absences was made by comparing published classroom attendance counts (School by School Room/Grade Reports) with the class sizes generated from the student fuel. The possibility of bias appeared to be minimal.

1. Mean achievement of the class on the Iowa Test of Basic Skills
2. Standard deviation of classroom achievement
3. Variance of classroom achievement
4. Skewness of classroom achievement
5. Mean IQ of the class on the Stanford-Binet Intelligence Test
6. Standard deviation of classroom IQ
7. Variance of classroom IQ
8. Skewness of classroom IQ

The chief limitation of the data is lack of adequate measures of student's family background or socio-economic status. The acquisition of student racial data was particularly important in this context. Since race and socio-economic status are known to be highly correlated, race will be serving as a proxy for the absent family background inputs. Racial information was available on students who had been enrolled in the city school system, elementary or secondary, as of September 1976.

Once the additional data were merged with the student/teacher file, a longitudinal record for each student was created. The student identification number, race, and sex variables were placed at the front of the record followed by the six years of achievement data, teacher data, school level data, college data, and peer group data. The construction of the longitudinal records produced a sample of 91,595 students, 55 percent with racial data. The statistical analysis reported here is limited to those 6,605 students with racial data who were present in the longitudinal file at least five consecutive years.

The sample was stratisfied on the basis of race. This stratification is justified because lack of adequate measures of family background income means race serves as a proxy for social class. Sample stratification is desirable since the proxy may not have the same meaning across groups; and no a priori reason exists to believe the two groups had identical production processes. Conventional tests of sample homogeneity confirmed the above suppositions.

Results

The initial basis for this report is a simple input/output model which follows students over five years.* Definitions, means and standard deviations for key variables are shown in Table 1, while Table 2 contains the regression results.

Insert Figure 1 and Tables 1 and 2 about here

An examination of Table 2 shows that two variables one would expect to be associated with achievement are consistently related to it. Students' IQ and students' achievement in 1975 are always related to achievement in 1976. The average achievement level of the students in any individual's 1976 classroom is also associated with that individual's achievement in 1976, lending support to earlier studies of contextual effects.

The experience of the 1975 teacher is positively associated with 1976 achievement for two of the three samples. Attendance in 1974 is significant in one sample and experience of the 1973 teacher is also significant in one sample.

The argument that effects variables like training and experience cannot be immediately seen is disputed by the findings. The experience and training of earlier teachers have no direct bearing on achievement in 1976. The achievement in 1976 is not directly related to the training and experience of the 1976 teacher. Nor is achievement in 1975, 1974 or 1973 related to the training or experience of teachers in those years.** Thus, it must be that 1) the effects of teachers' training and experience on academic achievement are not detectable with this model; or 2) that they do not exist; or 3) that they are felt over a much longer period of

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* See Figure 1.

** These equations were also run, although they are not reported here.

time. By extension these data give us no reason to assume that payment for training and experience has a consistent effect on student achievement. However, there is sporadic indication that teacher experience is effective, in that it is a significant variable, for at least one year, in all three samples.*

Conclusions and Next Steps

On one level our data is extremely disappointing. Despite being able to follow students over five years, and despite having a good data set with which to work, we are unable to uncover strong teacher effects in the production of academic achievement. In many ways, our findings mimic those of earlier studies: previous achievement levels and student IQ are excellent predictors of achievement. Teacher experience is occasionally a significant predictor of achievement and we see occasional signs that the effect of experience declines over time.

The effects of classroom, teacher and school variables is larger for black students than for white, a replication of earlier findings which we believe is important--probably in our sample at least, the family background of black students is much poorer than for the majority of whites. Schools represent just about the only route to academic achievement for these students, whereas more wealthy white students can draw on family resources in cases where schools are inadequate.

Our initial objective--to link the financial aspects of school inputs to student achievement has eluded us to this point. This is because we have been unable to obtain a successful resolution of the direct and indirect effects of various school and classroom level variables for which school districts make payments. The data analysis required to make these analyses has proven quite difficult, although we now feel on the verge of a successful analysis. That done, we will be able to directly link expenditures for training and experience to student outcomes.

* See Appendix

We have yet to run data analyses which link the achievement of students taught to teachers who have increased their levels of training and experience. We expect to obtain from this analysis a definitive assessment of the relation ship between training and experience and student outcomes.

School level variables explain virtually none of the variance in student achievement in this study. This being so, it is unlikely that variables such as administrative intensity, teacher and pupil attendance rates and various resource allocations which vary from school to school have much to do with achievement. This is not surprising, both in view of earlier findings and in view of the St. Louis Schools' committment to equality--which operationally means that there are few large school to school differences in the resources available to students. St. Louis also has surprisingly uniform rates of attendance for students and teachers. Thus, there is little room for school effects related to these variables to make themselves manifest.

Even assuming that relatively insignificant findings remain through the data analysis, we <u>are</u> left with some policy implications for school districts. The major implication is that districts should not pay for training and experience if their major objective in salary allocation is the improvement of student achievement. There are reasons for this aside from the fact that training and experience are not strongly related to student achievement: there is no serious control over the content of training, it is not necessary that a year of experience adds the same amount to each teacher's abilities. Given the presence of large-scale information systems in many school districts it is now possible to assess teacher performance quite accurately on the variables that are being sought by the school system. There is no longer any need to assume that training and experience are desireable. Finally, by tying salary to training and experience, it is likely

that schools have unwittingly done more to increase enrollments in colleges of education than they have done to improve the achievement of their students.

If training and experience are to be rewarded despite the tiny relationship between these variables and student achievement, then school districts should be careful to spell out a rationale for that expenditure of funds. We are not saying such a rationale does not exist, just that it does not appear to be the case that training and experience lead inexorably to improved achievement.

Appendix

Several other findings may be of interest. The possession of post-graduate degrees by teachers (masters or doctorate) was not related to student achievement in any of the samples. There was no interaction between the intelligence of students and teacher characteristics. Finally, our efforts to assess teacher quality via the Gourman scale produced tantalizing, but unfortunately statistically insignificant results. Because we think the quality of teachers warrants further investigation, we report the findings in some detail here.

The Gourman rating was split into four categories as follows:

$$\begin{array}{lll} > 200 & \text{and} & < 300 \\ \geq 300 & \text{and} & < 400 \\ \geq 400 & \text{and} & < 500 \\ & \geq 500 & \end{array}$$

The last categroy, + 500 was dropped from the regression, so the signs and coefficients are interpreted relative to the last category. If a high rating, ≥ 500 implies teacher quality, we would expect the signs on the first 3 categories to be negative since they are relative to the highest category. The results were as follows:

Blacks	Coefficients	t-statistics
Rating 76, 200-300	-2.2	-1.61
300-400	-2.5	-1.81
400-500	-1.2	-.76
≥500		
Rating 73, 200-300	-.821	-.71
300-400	.573	.49
400-500	-1.33	-.99
≥500		

Whites	Coefficients	t-statistics
Rating 76, 200-300	-.400	-.59
300-400	.632	.80
400-500	-.263	-.26
≥500		
Rating 73, 200-300	-.306	-.52
300-400	-.481	-.64
400-500	-.664	-.76
≥500		

Note, however, the frequency distributions of teachers of Whites and Blacks are as follows:

200-300	72-75%
300-400	18-20%
400-500	4%
≥500	5%

Thus the categories are highly skewed.

The Gourman scale is a rough and ready measure of the intellectual quality of teachers. The findings are in the right direction, and we urge researchers who follow us to try and obtain better measures of this variable. We fell it has great promise.

TABLE 1

MEANS AND STANDARD DEVIATIONS

OF

KEY VARIABLES

Teacher Characteristics

Variable Definition	Variable Name	White		Black Grade 7		Black Grade 8	
		Mean	SD	Mean	SD	Mean	SD
1973 instructors experience	TExp 73	14.8	12.3	10.6	10.2	10.7	7.8
1974 instructors experience	TExp 74	15.8	11.4	11.9	9.1	10.6	8.8
1975 instructors experience	TExp 75	16.3	11.1	12.6	8.7	11.6	8.9
1976 instructors experience	TExp 76	16.8	9.8	11.5	8.4	14.1	10.1
1973 level of education = 0 if B.A. = 1 if M.A., Ed. Spec. or Ph.D.	HDeg 73	.30		.12		.23	
1974 level of education = 0 if B.A. = 1 if M.A., Ed. Spec. or Ph.D.	HDeg 74	.33		.16		.21	
1975 level of education = 0 if B.A. = 1 if M.A., Ed. Spec. or Ph.D.	HDeg 75	.38		.22		.27	
1976 level of education = 0 if B.A. = 1 if M.A., Ed. Spec. or Ph.D.	HDeg 76	.37		.22		.36	
1973 instructor's undergrad. instit. Gourman rating = 0 if 300 = 1 if 300	Crating 73	.24		.33		.30	
1974 instructor's undergrad. instit. Gourman rating = 0 if 300 = 1 if 300	Crating 74	.25		.30		.30	
1975 instructor's undergrad. instit. Gourman rating = 0 if 300 = 1 if 300	Crating 75	.27		.31		.23	
1976 instructor's undergrad. instit. Gourman rating = 0 if 300 = 1 if 300	Crating 76	.24		.28		.22	

School Characteristics

Variable Definition	Variable Name	White		Black Grade 7		Black Grade 8	
		Mean	SD	Mean	SD	Mean	SD
Percentage student attendence - 1975 school	Atnd 75	92.4	2.6	91.7	2.2	91.5	2.3
Percentage student attendence - 1976 school	Atnd 76	92.0	2.0	91.4	2.1	91.6	2.0
Percentage non-white teachers in student's school - 1975	TNW 75	11.3	10.0	79.1	16.9	80.9	17.5
Percentage non-white teachers in student's school - 1976	TNW 76	15.4	8.8	77.9	18.6	80.2	16.9
Number of eligible students in 1974 school for compensatory programs	T1S 74	3.14	23.7	161.0	81.2	167.1	77.8
Number of eligible students in 1974 school for compensatory programs	T1S 75	4.15	30.9	205.9	103.1	216.8	96.5
Number of eligible students in 1975 school for compensatory programs	T1S 76	13.78	53.4	260.6	131.1	256.1	110.7
1976 school enrollment	SSz 76	462.03	151.7	620.1	200.9	564.1	184.7
1975 school pupil/teacher ratio	Ratio 75	28.7	2.4	26.7	3.5	26.4	3.1
1976 school pupil teacher ratio	Ratio 76	26.9	2.3	24.0	3.6	23.3	3.3
1975 instructor = 1 if degree in education = 0 if otherwise	EdDeg 75	.79		.77		.84	
1976 instructor = 1 if degree in education = 0 if otherwise	EdDeg 76	.80		.76		.82	

Classroom Characteristics

Variable Definition	Variable Name	White		Black Grade 7		Black Grade 8	
		Mean	SD	Mean	SD	Mean	SD
1975 class mean on Iowa Test of Basic Skills	MCS 75	72.08	11.4	58.4	6.0	67.1	6.9
1976 class mean on Iowa Test of Basic Skills	MCS 76	81.4	11.9	68.0	6.8	75.6	7.8
1976 class standard deviation on Iowa Test of Basic Skills	SDCS 76	11.7	3.1	11.0	1.9	12.5	2.3
1975 class size = 1 if class size ≥30 = 0 if class size <30	CSZ 75	.65		.54		.56	
1976 class size = 1 if class size ≥30 = 0 if class size <30	CSZ 76	.50		.38		.52	

Individual Characteristics

Variable Definition	Variable Name	White		Black Grade 7		Black Grade 8	
		Mean	SD	Mean	SD	Mean	SD
1975 Iowa Test of Basic Skills Composite Score	CS 75	75.1	14.5	61.0	10.9	68.7	12.7
1976 Iowa Test of Basic Skills Composite Score	CS 76	84.3	15.7	70.1	12.1	78.6	14.2
Stanford-Binet Intelligence Test Score	IQ	102.3	13.5	92.0	10.9	92.3	11.8
Student's sex = 1 if female = 0 if male	Sex	.50		.53		.53	
Title I code = 1 if eligible for compensatory programs = 0 if otherwise	TIT 76	.06		.92		.95	

TABLE 2

EQUATIONS PREDICTING 1976 COMPOSITE ACHIEVEMENT
ON
IOWA TEST OF BASIC SKILLS
FROM
VARIOUS TEACHER, SCHOOL, CLASSROOM, AND STUDENT CHARACTERISTICS

Variable Name	White Sample		Black Sample Grade 7		Black Sample Grade 8	
	Coefficient	(t)	Coefficient	(t)	Coefficient	(t)
CS 75	.837	35.70	.803	29.58	.817	24.91
IQ	.146	3.24	.278	4.75	.295	4.63
School 76	[a]		[c]		[d]	
Sex	.294	.93	.550	1.42	.109	.22
TExp 76	.119	.72	.415	1.46	.149	.52
TExp 76^2	.001	.44	-.005	-1.33	-.0006	-.16
TExp 75	.268	2.05	.156	.61	1.00	2.96
TExp 75^2	-.003	-2.12	.001	.48	-.004	-1.03
TExp 74	-.027	-.19	-.035	-.16	.264	.91
TExp 74^2	-.002	-1.63	.004	1.60	-.002	-.64
TExp 73	.029	.21	.441	2.16	-.149	-.49
TExp 73^2	.001	.66	-.002	-1.01	-.003	-1.18
HDeg 76	-3.80	-1.23	1.52	.29	6.94	1.41
HDeg 75	-3.99	-1.26	3.25	.74	.803	.15
HDeg 74	1.05	.33	-4.20	-.80	4.23	.72
HDeg 73	-.532	-.15	-3.77	-.52	-.191	-.03
College Rating 76 [b]	-.442	-.14	-4.15	.35	.048	.01
College Rating 75	-1.65	-.53	-3.88	.71	-7.59	-1.59
College Rating 74	-2.58	-.80	2.95	-.94	-4.45	-.98
College Rating 73	-2.29	-.75	1.44	-.85	9.09	1.89
EdDeg 76	-.691	-1.13	1.07	1.34	.162	.16
EdDeg 75	-.647	-1.01	-.066	-.09	-.784	-.92
EdDeg 74	-.273	-.48	-.400	-.51	.679	.86
EdDeg 73	-.265	-.56	-.169	-.25	.324	.41
MeanCS 76	.171	4.76	.227	3.43	.393	5.37
MeanCS 75	.030	.80	-.112	-1.85	-.140	-1.91
MeanCS 74	-.023	-.51	.031	.54	-.082	-1.44
MeanCS 73	.028	.76	.025	.50	.088	1.46

Variable Name	White Sample		Black Sample Grade 7		Black Sample Grade 8	
	Coefficient	(t)	Coefficient	(t)	Coefficient	(t)
SDCS 76	-.052	-.66	.160	.75	-.064	-.30
SDCS 75	.055	.49	.101	.57	.148	.77
SDCS 74	-.115	-.85	.031	.19	.078	.40
SDCS 73	-.196	-1.43	-.263	-1.61	.012	.06
Class Size 76	-.783	-1.45	-.399	-.44	1.54	1.30
Class Size 75	-.269	-.53	-.466	-.74	-.460	-.53
Class Size 74	-.319	-.74	-.070	-.12	-.296	-.45
Class Size 73	.616	1.31	-.070	-1.29	-.220	-.34
Attend 75	.583	1.90	.167	.75	-.191	-.47
Attend 74	-.455	-2.02	.134	.61	.275	.97
Title 1S 75			-.006	-1.08	-.006	-.74
Title 1S 74			-.004	-.77	.014	1.76
TAHend 75	.126	.74	.073	.34	-.008	-.02
TAHend 74	.003	.03	.052	.32	-.114	-.47
TNW 75	.076	.98	.014	.44	.031	.70
SchSize 75	-.0002	-.05	.002	1.03	.0006	.14
SchSize 74	.003	1.00	.001	.79	-.002	-.79
Pupil/Teacher Ratio 75	.154	.65	-.147	-1.14	-.018	-.08
Pupil/Teacher Ratio 74	-.172	-.70	.084	.66	.369	1.58
IQ * TExp 76	-.001	-.72	-.002	-1.04	-.0008	-.34
IQ * TExp 75	-.001	-.94	-.001	-.78	-.008	-2.92
IQ * TExp 74	.001	1.16	-.001	-.59	-.001	-.51
IQ * TExp 73	-.0005	-.45	-.004	-2.12	.003	1.04
IQ * HDeg 76	.027	.92	.020	.38	-.075	-1.44
IQ * HDeg 75	.045	1.49	-.036	-.77	-.002	-.03
IQ * HDeg 74	-.015	-.51	.045	.81	-.030	-.48
IQ * HDeg 73	-.00009	-.00	.035	.47	.005	.08
IQ * College Rating 76	.001	.06	.037	.73	-.013	-.26
IQ * College Rating 75	.021	.74	.047	1.08	.083	1.58
IQ * College Rating 74	.022	.70	-.034	-.77	.055	1.12
IQ * College Rating 73	.018	.64	-.016	-.38	-.092	-1.79
Constant	-31.40		-54.96		-39.68	
R^2	.912		.830		.832	
N	994		891		758	

a) School 76 was the school the student attended in 1976. There were 45 separate schools; however, none of these were significant at the .05 level. Dropping this set of variables lowers R^2 to .90.

b) A majority of the observations were at 270 (i.e., the instructors undergraduate college was rated 270) thus a break had to be made at 300.

c) School 76 was the school the student attended in 1976. There were 68 sepatate schools, 10 of which had statistically significant coefficients. Of these ten, seven were significantly negative. Dropping this set of variables lowers R^2 to .78.

d) School 76 was the school the student attended in 1976. There were 62 separate schools; however, none were significant at the .05 level. Dropping this set of variables lowers R^2 to .81.

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